

14. SRM Activities to Support Environmental Measurements

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Objective: To provide Standard Reference Materials with value-assigned concentrations of important toxic constituents. These SRMs serve as quality assurance tools for environmental measurement and monitoring efforts worldwide.

Problem: There are a wide variety of environmental monitoring and research programs in the U.S. Inaccurate analytical results lead to inappropriate actions. Therefore accurate analytical measurements are of utmost importance for facilitating sound environmental decision making. Quality assurance programs to enhance the reliability of analytical data often depend upon the availability of a broad spectrum of different control and Certified Reference Materials with matrices similar to the actual environmental samples analyzed.

Approach: For the past twenty years, NIST has provided a large number of natural-matrix SRMs to serve as accuracy benchmarks for environmental measurement and monitoring activities within the U.S. For many matrix and/or analyte combinations, NIST is the *de facto* source for such materials worldwide. Therefore, we are committed to developing new SRMs as needed, as well as recertifying high priority materials as their stocks are depleted and /or providing additional information for important new classes of analytes in both new and existing SRMs.

Results and Future Plans: Certification of a number of new and renewal environmentally-related SRMs has been completed recently. Several SRMs have been certified for both inorganic and organic constituents including:

- SRM 1944 "NY/NJ Waterway Sediment" with certified and reference concentrations of 52 PAHs, 29 PCB congeners, 11 chlorinated pesticides, 17 congeners of 2,3,7,8-substituted

polychlorinated dibenzo-p-dioxins and dibenzofurans, and 28 inorganic constituents;

- SRM 1649a "Urban Dust/Organic" with certified and reference values for 44 PAHs, 35 PCB congeners, 9 chlorinated pesticides, 17 congeners of 2,3,7,8-polychlorinated dibenzo-p-dioxins and dibenzofurans, 32 inorganic constituents, mutagenic activity, particle-size characteristics, total organic carbon, total extractable mass, and carbon composition;
- SRM 2977 "Mussel Tissue - Organic Contaminants and Trace Elements," and "SRM 2976 Mussel Tissue - Trace Elements and Methylmercury" both have values for PAHs, PCBs, chlorinated pesticides, trace elements and methylmercury.

SRMs completed this year with certified or reference values for inorganic constituents include:

- SRM 2584 "Trace Elements in Indoor Dust - Nominal 1 % Lead" certified for As, Cd, Cr and Hg;
- SRM 2579a, a set of 5 Lead in Paint films (certified for lead) with a blank film (the films are also individually sold as SRMs 2570-5);
- SRM 1641d "Mercury in Water," SRM 1630a "Trace Mercury in Coal" which has been value assigned for Hg, Cl and S;
- SRMs 2586 and 2587 "Trace Elements in Soil Containing Lead," which have been certified for EPA priority pollutant elements; and
- SRM 2782 "Industrial Sludge" which has also been certified for EPA priority pollutant elements.

SRMs completed recently with certified or reference values for organic constituents include:

- SRM 2978 "Mussel Tissue (Organic Contaminants - Raritan Bay, NJ)" with values assigned for PAHs, PCBs and pesticides;
- SRM 1650a "Diesel Particulate Matter" with certified and reference values for 44 PAHs, as well as particle size characteristics and total extractable mass; and
- two new diesel particulate-related materials, SRM 2975 "Diesel Particulate Matter (Industrial Forklift)" and SRM 1975 "Diesel Particulate Extract" (which is a dichloromethane extract of the diesel particulate material used in SRM 2975) with certified values for 10-15 PAHs.

The development of a fish tissue material, SRM 1946 "Lake Superior Fish Tissue," is in progress and it will be issued as a frozen tissue homogenate (similar to SRM 1974a and 1945) with certified values for PCBs, pesticides, total mercury, and methylmercury. Other new and renewal environmental SRMs that are currently in progress include SRM 1632c "Trace Elements in Coal" for inorganic constituents; SRM 1566b "Oyster Tissue" which will be certified for elemental content and methylmercury; SRM 2783 "Urban Air Particulate Matter (APM) on Filter for Trace Elements" which contains less than 1 mg of air particulate material per filter and will be value assigned for concentrations of approximately 25 elements; and SRM 270 "Hard Rock Mine Waste" which will be value assigned for EPA priority pollutant elements. The supply of some very popular natural matrix SRMs were recently depleted and renewals are currently in progress. These include: SRM 1632b "Trace Elements in Coal"; SRM 1566a "Oyster Tissue"; SRM 1941a "Organics in Marine Sediment"; and SRM 1575 "Pine Needles".

As part of a new program in support of the externalization of the U.S. Environmental Protection Agency's (EPA) Water Supply and Water Pollution Performance Evaluation (PE) studies program, NIST is preparing a number of new calibration solution SRMs for both organic and inorganic contaminants. For the semi-volatile organic contaminants 25 calibration solution SRMs have been prepared including six different Aroclors in methanol and transformer oil; toxaphene and total chlordane in methanol; chlorinated herbicides in methanol; chlorinated pesticides in acetone; haloacetic acids in methyl-*t*-butyl ether; 2,3,7,8 tetrachlorodibenzo-*p*-dioxin in methanol; endothall, glyphosphate, and diquat dibromide in water; chloral hydrate in methanol; carbamates in acetonitrile; and adipate and phthalates in methanol. For the volatile organic contaminants 15 single component calibration solution SRMs have been prepared, all in methanol, at the 1% concentration levels. Six of the solutions have been completed (benzene, toluene, ethylbenzene, *m*-xylene, *o*-xylene, and *p*-xylene (BTEX)). Work on three of the solutions is nearly completed (tetrachloroethylene, carbon tetrachloride, and 1,1,1 trichloroethane), and seven additional solutions have been ampouled and analyses are in progress (1,1-dichloroethene, dichloromethane, 1,2 dichloropropane, 1,2 dichloroethane, 1,2,3 trichloropropane,

isopropyl benzene, and *sec*-butylbenzene). Purities of the neat chemicals used to prepare the volatile and semi-volatile solution SRMs have been determined using appropriate techniques (i.e., DSC, GC-FID, GC-MSD, and/or LC), and additional certification measurements will be performed during FY00. Six additional solutions not yet identified are also planned for FY00. Finally one of five multi-component mixtures has been prepared in FY99 at the 2000 µg/mL level in methanol. For the inorganic solutions required for the EPA PE program, we will use the existing Single Element Spectrochemical Solution SRM series, and we have initiated the establishment of an NTRM program (discussed elsewhere in this report) to supply these materials.